BELLCOMM, INC.

SUBJECT: Trip Report - Discussion of
Lunar Orbiter Data Analysis
at MSC, January 13, 1966
Case 340

DATE: March 4, 1966

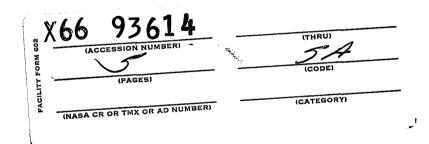**FROM:** C. J. Byrne
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ABSTRACT

Plans for Lunar Orbiter data analysis for the purpose of Apollo site selection were discussed at MSC. Dr. Naugle (MSC) described available software and hardware, manpower and a number of problem areas.

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MEMORANDUM FOR FILE

Plans for Apollo site selection analysis of Lunar Orbiter data were discussed with Dr. N. Naugle of MSC. Dr. Naugle is responsible for preparing the computer program which will be used at MSC for Apollo site selection data analysis.

The computer software is to be broken down into five discrete programs:

System

Filtering

Brightness-to-elevation

Statistical analysis

Contours

"System" controls the data flow from video tapes to digital tapes. By means of a synchronizer it provides for the interface between the computer and external equipment such as the analog-to-digital converter and a visual display unit.

"Filtering" encompasses all the operations related to correcting the received image for degradations introduced by the photographic and communications subsystems. These degradations are described in Reference 1.

In the "brightness-to-elevation" step, the elevation of each spot in the picture is calculated based on the corrected image, related calibration data, and the lunar photometric function. Work by Nathan, Rindfleisch, and Smith at JPL will be used in this work.

"Statistical Analysis" measures the landing site quality in terms of distributions of certain hazards such as slopes and protuberances. Both hazards and terrain contours are calculated using the elevation data previously obtained.

The total manpower for all of this work consists of 8 people, broken down as follows:

Systems	3
Brightness-to-elevation	2
Statistics	2
Filtering	1

Other programmer efforts can be called for as needed for specific tasks.

The Lunar Orbiter data will be analyzed in chits, each 800 x 800 samples, representing an area of about 500 x 500 ft. The time required for all operations except filtering will be 1.5 to 3 minutes per chit. As experience with real data is accumulated, it may be possible to reduce the number of samples per chit. It is expected that LRC will provide recorded information on auxiliary tape channels, which can be used for chit indexing (Reference 2).

Selection of chits for analysis and definition of the statistical work is the responsibility of the Apollo site selection coordinating group, under the direction of J. Sasser, MSC.

A Univac 1108 computer is to be used, and it is expected that the computer will be available up to 16 hours a day during the period of actual Lunar Orbiter data processing. The computer has been installed at MSC and is being debugged.

Preparations for all steps except filtering are proceeding well and it is expected that they will be ready by mid-year 1966. However, at the present time no provisions have been made to feed the results of photogrammetric calculations or soil mechanics into the computation of elevations and the

program relies entirely on brightness values. Another problem is the accuracy with which the trajectory will be known, and hence the accuracy of the position vectors needed for data analysis. Dr. Naugle expressed willingness to supply copies of digital data to other users but has no authorization to digitize data other than for Apollo site selection.

Dr. Naugle may have to completely bypass the filtering and thus computations may be made entirely on unfiltered and uncorrected data. The primary reason for this is the unavailability of Lunar Orbiter calibration data. In addition, it is not entirely clear what the best computer filtering methods might be and which of the many necessary corrections ought to be included and which could be neglected. Hence, considerable study will be needed to develop the necessary procedures.

Dr. Naugle stated that he is making no preparation for taking data directly from photographs or for analyzing data taken from photographs. Magnetic tape recordings will be the prime source of data for MSC analysis.

C. J. Byrne

F. S. Flatow

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Attachment
  References

Copy to
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REFERENCES

1. F. S. Flatow, The Lunar Orbiter Photographic Data Channel Bellcomm Technical Memorandum, TM 65-1012-9, November 1, 1965.

2. F. S. Flatow, Discussion of Lunar Orbiter Data Processing at LRC, Bellcomm Memorandum for File, December 15, 1965.